SURFACE WATER 1.2

Before sample collection, sampling sites must be selected (section 1.2.1). For each sampling site, NWIS files and a field folder must be established, updated, and reviewed (section 1.2.2).

- The study team is responsible for selecting sampling sites and conditions (such as time of year, flow rate or stage) that will yield samples representative of the aqueous system being studied.
  - Each body of flowing and still surface water has a unique set of conditions that needs to be identified and considered in the site-selection process.
  - Field personnel must be trained in the correct and current water-quality data-collection procedures and must exercise judgment gained from field experience in order to make appropriate site selections.
- The study team is responsible for establishing and maintaining files for each sampling site.
  - Careful and complete documentation of site information and data collected must be input to electronic and paper files.
  - The field folder must include all the information necessary for efficient field operations.

SELECTION OF SAMPLING SITES 1.2.1

Once field work has begun, field personnel must select the point(s) or transect(s) at which samples will be collected. In most bodies of flowing or still water, a single sampling site or point is not adequate to describe the sampling area's physical properties and the distribution and abundance of chemical constituents or biological communities. Location, distribution, and number of surface-water sampling sites can affect the quality of resulting data. Generic guidelines for selecting flowing-water and still-water sites are described in this section.

When selecting surface-water sampling sites:

- Safety of field personnel comes first.
- Consider the study objectives, types of data needed, equipment needs, and sampling methods.
- Obtain all available historical information.
- Consider physical characteristics of the area, such as size and shape, land use, tributary and runoff characteristics, geology, point and nonpoint sources of contamination, hydraulic conditions, climate, water depth, and fluvial-sediment transport characteristics.
- Consider chemical and biological characteristics of the area (aquatic and terrestrial).

1.2.1.A Flowing-Water Sites

Flowing-water sites refer to streams (fast or slow, intermittent, ephemeral, or perennial), canals, ditches, and flumes of all sizes and shapes, or to any other surface feature in which water moves unidirectionally. All or parts of reservoirs and estuaries that flow unidirectionally are considered to be flowing water. Global-positioning system (GPS) equipment is useful to identify sampling-site location. Determine latitude and longitude from maps or by land-survey techniques.

Flowing-water sampling sites optimally are located:

- At or near a stream-gaging station, to obtain concurrent surface-water discharge data required for computing constituent-transport loads and to determine discharge/constituent-concentration relations. (Measure discharge at time of sampling if a stream-gaging station is not at or near the sampling site or if discharge cannot be rated or estimated with sufficient accuracy.)
- In straight reaches with uniform flow, with a uniform and stable bottom contour, and where constituents are mixed along the cross section.

- Far enough above and below confluences of streamflow or point sources of contamination to avoid sampling a cross section where flows are poorly mixed or not unidirectional.
- In reaches upstream from bridges or other structures, to avoid contamination from the structure or from a road surface.
- In unidirectional flow that does not include eddies. (If eddies are present within the channel, sample only the unidirectional flow.)
- At or near a transect in a reach where other data are collected (such as data for suspended sediment, bedload, bottom material, or biological material) and (or) for which historical data are available.
- At a cross section where samples can be collected at any stage throughout the period of study, if possible.

After a tentative selection of a sampling site, develop a preliminary profile of field measurements[5] at various locations along the cross section (NFM 4 and NFM 6). The field-measurement profile is used to indicate reach homogeneity (see TECHNICAL NOTE). Final site selection is based on a comparison of these field measurements with the data requirements of the study.

TECHNICAL NOTE: The preferred sampling method and number of verticals to be sampled within the stream cross section that are needed to obtain a sample that is sufficiently representative depends on stream homogeneity as indicated by the field-measurement profile and stream-discharge or other data, as well as by study objectives. Sampling methods are described in NFM 4. Note that the field-measurement profile is a useful guideline, but might not be representative of chemical homogeneity for the analytes of interest. Also, it might be desirable to move to a sampling site upstream or downstream to adjust for seasonal variation or extreme flow conditions.

[5]Field-measurement methods are described in NFM 6. The profile of the cross section usually includes measurements such as specific electrical conductance (conductivity), pH, temperature, dissolved oxygen, and turbidity.

The guidelines used for selecting sampling sites on ephemeral and intermittent streams are the same as those for perennial streams. Ephemeral and intermittent stream sites need additional planning and examination to account, for example, for conditions related to rapidly changing stage and discharge that can occur as a result of flash flooding or urban runoff.

CAUTION: Any stream, including an ephemeral or intermittent stream, can rapidly become too deep and swift to wade safely.

1.2.1.B Still-Water Sites

Still-water sites refer to all sizes and shapes of lakes, reservoirs, ponds, swamps, marshes, riverine backwaters, or any other body of surface water where water generally does not move unidirectionally. All or parts of reservoirs that do not flow unidirectionally could be considered to be still water.

When locating still-water sampling sites:

- Use in situ field measurements to help determine vertical and spatial distribution of sampling locations.
- Avoid areas near structures such as harbors, boat ramps, piers, fuel docks, and moored houseboats (to avoid point sources of contamination), unless these structures are part of the study.
- Select sites with a record of historical data, if possible.

INFORMATION FOR NATIONAL WATER INFORMATION SYSTEM (NWIS) FILES AND FIELD FOLDERS 1.2.2

Field personnel are responsible for establishing and maintaining electronic and paper site files. The information required for establishing electronic records in NWIS and for creating field folders for surface-water sampling sites is summarized below.

NWIS Files 1.2.2.A

USGS policy requires specific information on surface-water sampling sites to be stored in the site file in NWIS (Edwards and others, 1987; Hubbard, 1992; WRD Memorandum 92.59). Results of water analyses are stored in the water-quality file (QWDATA) of NWIS. The Automatic Data Processing System (ADAPS) contains continuous records of water levels and water quality. The minimum information required for establishing electronic files in NWIS for surface water is listed in table 1-1. Individual studies and District offices may have additional data-storage requirements.

If the site location has been identified:

- Establish or check the NWIS site file before the field trip.
- Update the files promptly after the field trip.
- Fill in information that is needed by, or could be useful to, the study in addition to the information shown on table 1-1.

RULE OF THUMB:

Before starting fieldwork—Make sure the NWIS file is established.

After fieldwork—Input updates to NWIS files promptly.

Table 1-1. Minimum information required for electronic storage of site and surface-water-quality data in the U.S. Geological Survey (USGS) National Water Information System (NWIS)

[GWSI, Ground-Water Site Inventory; QWDATA, Quality of Water Data]

Information required for creation of a surface-water site in NWIS[1, 2]		
Data description	Component (C) number for data entry into GWSI	Example (Description of code)
Agency code	C4	USGS
Station Identification Number	C1	11530500
Station Name	C12	Klamath River near Klamath, Cal.
Latitude	C9	413052
Longitude	C10	1235957
District/User	C6	06 (California)
State	C7	06 (California)
County	C8	015 (Del Norte)
Agency Use	C803	A (Active)
Station Type	C802	SW
Information required for storage of sample analyses in the water-quality file of NWIS (QWDATA)[1]		
Data description	Alpha parameter code	Sample data (Description of code)
Agency code	AGNCY	USGS
Station Identification Number	STAID	11530500
Sample Medium	MEDIM	9 (surface water)
Sample Type	STYPE	9 (regular sample)
Hydrologic ("Hydro") Event	EVENT	9 (routine sample)
Hydrologic ("Hydro") Condition	HSTAT	9 (stable stage)
Date (year/month/day)	DATES	19880909
Time (standard 24-hour clock time)	TIMES	1530 hrs
Analysis Status	ASTAT	H (initial entry)
Analysis Source	ASRCE	9 (USGS laboratory and field)

[1]Numerous additional data fields are available in NWIS that can be useful for data analysis or mandatory for meeting study objectives; for example, indicating whether a non-USGS agency collected the data.
[2]Modified from Ground-Water Site Schedule Form 9-1904-A, May 1991. Also refer to Mathey (1991) and Garcia and others (1997).

1.2.2.B Field Folders

Selected information that is needed for reference while at a surface-water site is kept in a field folder. The field folder contains information needed by trained personnel to locate and safely collect and process water samples. The field folder is taken along on each sampling trip. General contents of the field folder are listed on the field-folder checklist (fig. 1-2), but the folder should be customized according to study needs.

Field-folder checklist: surface-water quality		
✓	Item	Comments
	Station description: • Location of gaging station (if one is present). • Location of sample-collection sites: high and low streamflows. • Hydrologic and geologic sections. • Name of landowner, tenant, or other responsible party. • Site access instructions (for example, call owner or site operator before arrival at site, obtain key to unlock security gate). • Photographs to document site conditions.	
	Maps to site (State and local)	
	Profiles of cross section of stream channel at sampling location(s). • Stream-bottom geometry. • Physical and chemical measurements.	
	Safety information (NFM 9): • Nearest emergency facilities. • Phone numbers (home) of study chief or supervisor. • Traffic condition and traffic plan showing where to park, placement of flags and cones. • Location of power lines. • Environmental hazards, such as weather and animals.	
	Sampling schedule: • Laboratory analyses to be requested and associated codes. • When to collect samples (high or low flow).	
	Bottle types needed for each analytical schedule.	
	Analytical Services Request form(s) and example of a completed form.	
	Sampling instructions: • Cumulative-discharge curves at about 10-, 50-, and 90-percent duration. • Velocity cross sections at about 10-, 50-, and 90-percent duration. • Equipment to use at various flows. • Flow-duration curve. • Discharge rating curves and (or) tables.	
	Shipping instructions: • Amount of ice to use. • Mailing labels to and from laboratory. • Location of nearest post office or shipping agent.	
	Surface-water field form and an example of completed form.	
	A tabulation sheet for each type of bacteria enumerated at the site (include example with date of sample, streamflow, volumes filtered, dilutions, plate counts).	
	Plots of field-measured data (last 5-10 years of record); if there is a good enough relation to show outliers, include: • Conductivity versus streamflow. • Conductivity versus alkalinity. • Temperature versus time.	
	Statistical summary of historical water data: • Seasonal, maximum-minimum values. • Discharge-related maximum-minimum values.	
	Special equipment needed to address site-specific conditions: • Sampling. • Safety.	

Figure 1-2. Checklist for contents of surface-water-sampling field folder.